Pest Management Alliance Project Final Report
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Pest Management Alliance For The Containerized Nursery Industry

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Acknowledgments. We thank the participation in this project of the following containerized plant nurseries: Tree of Life Nursery, San Juan Valley, Orange Co.; El Modeno Gardens, Irvine, CA; Don's Wholesale Nursery, Anaheim; Sakaida Nursery, Trabuco Canyon; Color Spot Nursery, San Juan Capistrano; Skypark Nursery, Anaheim; the Pardee Tree Nursery, Bonsall; and Bordier's Nursery in Irvine. We also thank the South Coast Research and Extension Center, University of California, for use of their facilities for meetings and ongoing projects.

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Executive Summary

The Pest Management Alliance (PMA) for the containerized nursery industry has 5 main goals:

1. To encourage statewide adoption of reduced-risk, IPM practices by containerized nursery owners.
2. To expand and strengthen dissemination of IPM information to nursery growers.
3. To substantiate cost-effective reduced-risk practices through the use of demonstrations.
4. To develop reduced risk strategies that legally certify nursery shipments free of red imported fire ants.
5. To encourage water management practices that reduce pesticides and fertilizers in run off.

To meet these goals, the PMA had 2 major objectives for the first year. The **first major objective** was to find alternatives to the use of organophosphates and carbamate insecticides to control ants. Our accomplishments for this objective include:

1. The demonstration of improved methods of monitoring for red imported fire ants (RIFA), *Solenopsis invicta* Buren, in nurseries. Improved monitoring means that pesticides are used only when the pest is found, thereby reducing the use of pesticides. We chose nurseries that had been positive for RIFA. Our first monitoring method at the Tree of Life Nursery (Fig. 1) involved the placement of protein and sugar water bait stations every 20 ft in a grid pattern around the nursery. We did this monthly for 12 months and recorded all species of ants that we found. We never found RIFA subsequent to the original infestation, thereby preventing the application of pesticides every 3 months, as the state quarantine usually requires. We thus avoided the use of pesticides on 36 acres at this nursery during the year of monitoring. We have demonstrated that effective monitoring can substitute for quarterly broadcast pesticide applications.

   At 4 other nurseries in Orange Co. we did intensive monitoring for RIFA around new infestations. Our method of placing monitors in the pattern of a wheel around the find (Fig. 2) showed the extent of the infestation in each case, thereby justifying the use of pesticide in a small area around the infestations. These data have helped persuade state quarantine officials that monitoring for fire ants is reliable. Therefore, the requirement for quarterly broadcast of pesticides in nurseries has been relaxed and only the immediate vicinity of the infestation needs to be treated.

2. Evaluating possible alternatives to organophosphate and carbamate insecticides currently used for RIFA control. All nurseries infested with RIFA are immediately treated. Thus, to evaluate new products we ran several long-term studies at golf course communities in the Coachella Valley (Figs. 3 and 4). We have demonstrated that a new pesticide, fipronil, is effective against fire ants in California. This product has a much longer residual effect than other pesticides, thus reducing the frequency of treatments (once a year instead of 4 times a year, according to experts who have tested it in other states). The fipronil does not require turning off irrigation, as do other fire ant products. Fipronil will soon be on the market in California and will be available for fire ant control.

   In the laboratory we have also successfully shown the efficacy of 4 liquid toxicants for use in fire ant bait stations that avoid any ground contamination with pesticides. These toxicants will be field tested as sites in nurseries or golf courses are available. We have also evaluated 4 drench alternatives for potted soil for ant control. As we find promising materials we will lobby the USDA for changes in regulations regarding soil incorporation of pesticides.

The **second objective** was to help reduce the amount of insecticide runoff from nurseries. The fire ant quarantine at plant nurseries requires that bifenthrin or chlorpyrifos be added to potting soil to prevent colonization of fire ants. These products have been detected in water runoff from nurseries operating under the California Department of Food and Agriculture compliance program. Chlorpyrifos is an identified pollutant that has been found in various water bodies in the state and is a listed pollutant in the Newport Bay/San Diego Creek watershed TMDL, which is in the fire ant quarantine area. The initial task was to set up a nursery site to demonstrate the protection of surface and groundwater quality (El Modeno nursery). Pesticide runoff has been significantly reduced, with bifenthrin concentrations being reduced by 54%. The second phase was then to have grower forums and workshops to demonstrate these practices. Over 50 lectures, seminars, and workshops have included information fulfilling the objectives of the PMA grant (see Table 5).

We have added a **third major objective** that pertains equally to the first two: developing a website and newsletter for the PMA. We have set up a committee and workgroup to develop the web site, and have entered into a contract for its development. An agreement has also been reached with the California Association of Nurserymen (CAN) to host the website on their server.

Objective I. Alternatives to organophosphates and traditional pesticides.

Task 1. Improving Monitoring Techniques for Red Imported Fire Ants

A. Tree of Life nursery.

Two ant-monitoring techniques were employed at the Tree of Life Nursery in San Juan Valley to determine if native and invasive ant species were on the property. Tree of Life Nursery is situated on 36 acres of which 20 are in actual production (Fig. 1). RIFA, *Solenopsis invicta* Buren, were discovered on the property on November 1999, and the nursery has been monitored ever since. This nursery is also special because it specializes in plants for restoration projects and tries to maintain the property free of Argentine ants, *Linepithema humile* (Mayr). Consequently, this nursery was an ideal site for demonstrating various ant-monitoring techniques.

Initially the property was inspected by CDFA. Their monitoring technique is as follows: Approximately 3 g of Spam luncheon meat is placed in a small plastic cage. The cages are staked into the ground approximately every 50 ft in a grid (20 bait stations per acre) in areas suspected of having *S. invicta*. The monitor stations are placed out in the early morning about 0900 hours and the species of ant feeding on the Spam are recorded after 4-5 hours. The monitoring system is qualitative and no attempt is made to determine the number of ants present. Properties that are positive for *S. invicta* are monitored every 3 months as part of the Quarantine Procedure. Table 1 shows the species that CDFA identified at this location.

Pesticides were applied to the one location that had RIFA. Instead of treating the entire nursery, as normally required by the quarantine protocol, we received permission to substitute intensive monitoring of the nursery for wide-scale pesticide application. We placed 148 bait stations in a grid pattern along the rows of the nursery (see Fig. 1). We used two monitoring techniques to determine the presence of RIFA and other ant species, to look for seasonal patterns in bait attractiveness to the ants, and to see whether one technique was more sensitive than the other. Each station had one protein and one sugar water bait, placed side by side. The baits were covered with clay pots to protect them from water and animals. For the protein bait we used 9 Lives Cat Food ground to 18 mesh particle size; we filled a 15 ml tube approximately half way with the food. Next to it we placed vials of sugar water. Using liquids to monitor ant activity is based on a technique developed by Reierson *et al.* (1998) to monitor Argentine ant foraging activity. Conical vials containing 13 ml of 25% sucrose water are placed on pedestals. The vials are

covered with an inverted clay pot to protect them from irrigation and wild animals. The vials containing sugar water were placed out next to the solid baits and retrieved after 24 hours. The number of ants at each station and the species was recorded. The Tree of Life nursery was monitored monthly for one year.

Results. Table 1 shows the species originally found by CDFA with their Spam baits. Table 2 shows the numbers of ants collected at either the sugar water (L) or the cat food (S), and Table 3 shows the number of monitors positive for each species. The sugar water vials collected significantly more ants than did the solid baits for *Dorymyrmex bicolor* and *D. pyramidis*, *Tapinoma sessile*, *Formica pilicornis*, and *Solenopsis xyloni*. Neither bait was effective in sampling *Pogonomyrmex occidentale, Solenopsis molesta,* or *Cardiocondyla ectopia*.

The sugar water baits were extremely effective in determining if *D. bicolor*, *T. sessile*, *F. pilicornis*, and *S. xyloni* were present throughout the year (Table 3). Only on rare occasions were ants collected at the solid bait and not at the sugar bait. *S. xyloni* was frequently found on both baits, especially during summer months. In the winter months, the sugar water baits were the most effective for the species responding to either bait.

Our intensive monitoring of this location avoided wide-scale application of pesticides. It demonstrated that sugar water is a very effective monitor for many ant species any time of the year.

B. Wheel method for monitoring fire ants at nurseries.

One of the goals of monitoring for fire ants is delimiting the location of the ants in positive nurseries. Pesticide treatments can then be put only in those areas that have the ants. We designed a "wheel method" of monitoring fire ants where ant monitors are placed around a known infestation in the form of a wheel with 8 spokes (Fig. 2). The center of the wheel corresponds to the known ant colony and sugar water and luncheon meat monitors are then placed every 10 ft along the spokes of the wheel. We left the monitors for 24 hrs and then recorded where we found RIFA. In this way we got a precise picture of the infestation and the distance the ants were foraging. We tried this method at 4 nurseries: Don's Wholesale Nursery, Sakaida Nursery, Color Spot Nursery, and Skypark Nursery, all in Orange Co.

Results. We placed a total of 145 monitors in these 4 nurseries. We found RIFA either at or within 1 ft of the monitors at 18% of the bait stations. However, sugar water missed 27% of known RIFA locations, and the luncheon meat missed 38% of known RIFA locations. The meat and sugar water side by side only missed 12% of known RIFA locations. Thus, the two monitors together were more successful than either one alone. Finally, there were 160% more ants at the sugar water than the meat monitors. Thus we have shown that a sugar water and protein bait together is more efficient than either one alone.

There are a couple of likely reasons for failure to detect RIFA at these monitors. The most important is the presence of Argentine ants, which can chase RIFA from the monitors. Another possible reason is that fire ants that have been treated with pesticides may be queenless and not interested in feeding.

C. Monitoring at other nurseries.

The Pardee Tree Nursery in Bonsall, Orange Co., has adopted our technique of monitoring for fire ants using sugar water. They have laid out a grid of sugar water monitors at 50 ft intervals throughout their nursery as an early detection method for RIFA. Because of this monitoring state officials have not had to do additional surveys at this location.

D. Pitfall traps

We are demonstrating the use of pitfall traps for RIFA detection in nurseries and golf courses. We are constructing aboveground devices that can work in areas that may flood due to irrigation. We plan to

leave these traps in place for a couple of weeks to supplement quarterly fire ant detection monitoring. We are searching for the best materials to use for these devices and also for the best substrate for the ants to walk on.

E. Corn chips vs. luncheon meat as ant monitors

We have completed several laboratory and field trials comparing the efficacy of luncheon meat and corn chips in attracting fire ants to monitors. These trials were done at Coto de Caza and in Rancho Mirage. We do these trials in a large aluminum dish that has up to 10 tubes containing pre-weighed amounts of the test materials. The ants enter the dishes through plastic tubes and are free to take the materials back to their nests. The tubes are then weighed again. In all trials thus far the fire ants have shown preference for the luncheon meat. However, the corn chips are cheap and easy to place on the ground in larger numbers. We will continue to evaluate which material is appropriate for which circumstances.

Task 2. Replacement of Organophosphates and other Pesticides

A. Demonstrating the use of new RIFA products. We have run two demonstrations of the efficacy of fipronil at two country clubs in the Coachella Valley: Sunrise and Rancho Las Palmas, both in Rancho Mirage. At each of these locations we compared the efficacy of fipronil with the standard treatments in use by the eradication agencies. They typically apply baits containing an insect growth regulator (pyriproxyfen) followed a week later by a bait with hydramethylnon. These treatments are repeated every 3 months because they break down quickly and there is no residual action beyond a couple of days. On the other hand, granular fipronil binds tightly to the upper layer of soil and has an extended residual effect. This characteristic is important in preventing new reinfestations by fire ant queens that fly and drop into new areas, where they start new colonies. Figs. 5 and 6 show typical results.

B. Trials with liquid toxicants. Another plan to reduce pesticide usage is to use toxicants in sugar water bait stations, avoiding the use of any pesticides that touch the ground. We have begun laboratory and field-testing of toxicants in sugar water. We currently have 4 products with adequate water solubility for use in sugar water baits: boric acid, fipronil, thiomethoxam, and imidacloprid. In the laboratory, for each of these products we set up 10 petri dishes at each concentration of toxicant with 10 RIFA workers in each to measure the time to kill half of the ants (LT50). A second step was to set up mini-colonies consisting of 300 RIFA with a supply of the sugar water toxicant and we again measured time to kill half of the workers. We are currently doing the field-testing of these products at RIFA sites to demonstrate that the liquid toxicants can eradicate fire ants.

C. Drench Substitutes. The fire ant quarantine at plant nurseries requires that bifenthrin or chlorpyrifos be added to potting soil to prevent colonization with fire ants. These insecticides are showing up with water runoff. Our goal is to screen natural oils and non-pesticides to see whether we can find an alternative that would prevent ant colonization of potted plants. Thus far we have looked at Orange Guard (limonene), Nouguard (capsaicin), Exxant (a turpentine solution), and other plant oils. We put 300 ants into small pots with soil, added the liquid, and recorded either death of the ants or whether they left the pots. Thus far we have found that the limonene and turpentine solutions immediately cause the ants to leave the soil. The latest product we are examining is a neem oil derivative in a solid matrix that we are mixing with potting soil. We are going to show whether the material successfully keeps ants out of soil. Continued screening of these products should help to find reliable drench substitutes.

D. New fire ant bait

Ongoing demonstration of a new fire ant bait, "Chipco Firestar Fire Ant Bait", from Aventis. This bait has an extremely low concentration of fipronil (0.00015 %) in a matrix consisting of a mixture of proteins, oils, and carbohydrates. These baits may prove as effective as two standard treatments consisting of pyriproxyfen followed by hydramethylnon. We began 2 demonstrations on August, 2001 in South Orange Co. at Coto de Caza and Ladera Ranch. At that time we did pretreatment surveys of the ant populations. The first bait application at Coto de Caza was done one Sept. 6. A second application was done on November 5. The Ladera Ranch treatment was done on October 4. We did follow-up surveys of ant populations every 2 weeks. We did an additional trial of the bait at the Annenberg estate in Rancho Mirage, near Palms Springs, on Oct. 11.

Objective II. Protection of surface water and groundwater.

Task 1. Demonstration of runoff mitigation.

A very successful pesticide runoff mitigation demonstration project has been implemented at a PMA member site (El Modeno Gardens, Irvine, CA). In November 2001 we began testing the addition of polyacrylamide to assist in the mitigation of pesticide runoff from the nursery. A multiple strategy plan was implemented utilizing several of the innovations listed in our PMA plan in addition to the use of polyacrylamides. These innovations were:

- Improve irrigation management techniques to reduce pesticide and fertilizer run off.
  - El Modeno is upgrading their computerized irrigation software.
  - Irrigation system is being checked for any maintenance problems and greater attention will be paid to run times and application uniformity.

- Optimize timing of applications and select best fertilizer formulations to reduce nitrate levels in runoff.
  - Slow release fertilizers will be used whenever possible.
  - Use technology such as electrostatic sprayers to minimize off target movement of pesticides.
  - Scout more intensively so pests are taken care of early before heavy populations require more spray treatments.

- Use of vegetative border strips, grading, sand bags and holding ponds to reduce pesticide runoff.
  - Use upstream sediment traps to reduce sediment load reaching vegetative filter.
  - Move runoff from the center of roads to the side of the road in cement lined ditches.
  - Divert runoff into pipes whenever possible to prevent picking up sediment.
  - Sand bags and holding ponds to reduce pesticide runoff.

Initially, one site was chosen to develop protocols and field experience with the management of the system. As part of their RIFA monitoring program, CDPR is monitoring pesticides in the runoff prior to entering the vegetative filter, which consists of a patented Canna Lily (Tropicana) and after exiting the vegetative filter. Canna lilies are planted in a cement drainage channel. Space for growing plants is in short supply, and the use of the drainage channel to grow a profitable patented plant variety has resulted in an economic incentive to implement the pesticide and nutrient mitigation and also has the added benefit of utilizing the nutrients, which would have run off the property as a pollutant. Flow and weekly nutrient monitoring is being funded by grants from CDFA-FREP (Fertilizer Research and Education Program) and the EPA 319(h) program.

The implementation of polyacrylamides to flocculate fine sediments out of the runoff water, which we believe will dramatically reduce the offsite movement of bifenthrin, was initiated full scale at the nursery in January, 2002. A concentrated form of polyacrylamides is added to the turbulent stream of runoff prior to a sediment trap and pond at an approximate rate of 10 ppm. Flocculation occurs rapidly allowing the majority of the sediment to settle in the trap and pond. The sediment trap allows for easy removal of sediment with a front-end loader as opposed to allowing sediment to accumulate further into the system (i.e. vegetative filter), where removal results in higher labor costs.

CDPR is continuing its monthly sampling of surface runoff entering and leaving the system and has conducted two samplings since the addition of polyacrylamides to the runoff. The overall goal is to reduce bifenthrin in runoff leaving the nursery to non-toxic levels (< 0.078 ppb) using a combination of general management practices as well as innovative mitigation techniques.

Dr. Kean Goh (California Department of Pesticide Regulation) noticed that even before the Canna plants were placed in the channel, our other mitigation efforts such as grading, building a sediment pond, and fine-tuning the nursery's irrigation system, resulted in a dramatic reduction in sediment and runoff. In the RIFA Project in Orange County, June 2001 (STUDY 183) Dr. Goh states: "During June 2001, surface water samples were collected from five sites in Orange County, California. Water samples collected from a mitigation filter strip planted with *Canna* showed a 54% reduction of bifenthrin concentrations (Table 4)."

Task 2. Forums and workshops to disseminate information.

Over 50 lectures, seminars, and workshops have included information fulfilling the objectives of the PMA grant (see Fig. 6, Table 5). On September 14, 2000 the Nursery PMA conducted a workshop/conference at the University of California, Riverside. The workshop was attended by over 100 nursery and landscape professionals and dealt with the issues and challenges facing the nursery industry in California. Top experts in their areas gave presentations on subjects such as the Glassy Winged Sharpshooter, Red Imported Fire Ants, Pesticide Runoff, etc. A poster session was held at the end of the conference giving attendees and researchers a chance to interact. Evaluations overwhelmingly gave the workshop an excellent rating.

The PMA held a **Glassy-winged sharpshooter (GWSS) training meeting** for nurseries and allied industries on January 24, 2002. The meeting was held in Irvine, California at the University of California South Coast Research and Extension Center and attended by over 50 people. The attendees received information about the regulations for shipping plants from Craig Hanes of CDFA. County entomologists from Orange (Nick Nisson) and Napa (Joel King) Counties explained how county inspectors examine plants for adults for egg masses and adults in both the shipping and receiving counties.They also provided information regarding insecticide trials and trapping methods for monitoring. Dr. David Morgan from CDFA finished up the meeting by reporting on his work on identifying, rearing, and releasing biocontrols for GWSS.

Objective III. *Setting up a Pest Management Alliance Website*

The Pest Management Alliance for the Containerized Nursery Industry (PMA-CNI) web page is up and running and is available for general use at **http://www.pmacni.com/**. The web page describes what the pest management alliance is, and provides information and links to quarantine regulations, PMA demonstration results and reports, common pests of container nurseries, and will provide a calendar of nursery-related educational programs. We purchased a new server for the web page.

References Cited

Reierson, D.A., M. K. Rust and J. Hampton-Beesley. 1998. Monitoring with sugar water to determine the efficacy of treatments to control Argentine ants, *Linepithema humile* (Mayr)., pp. 78-82. *In* Proceedings of the National Conference on Urban Entomology.

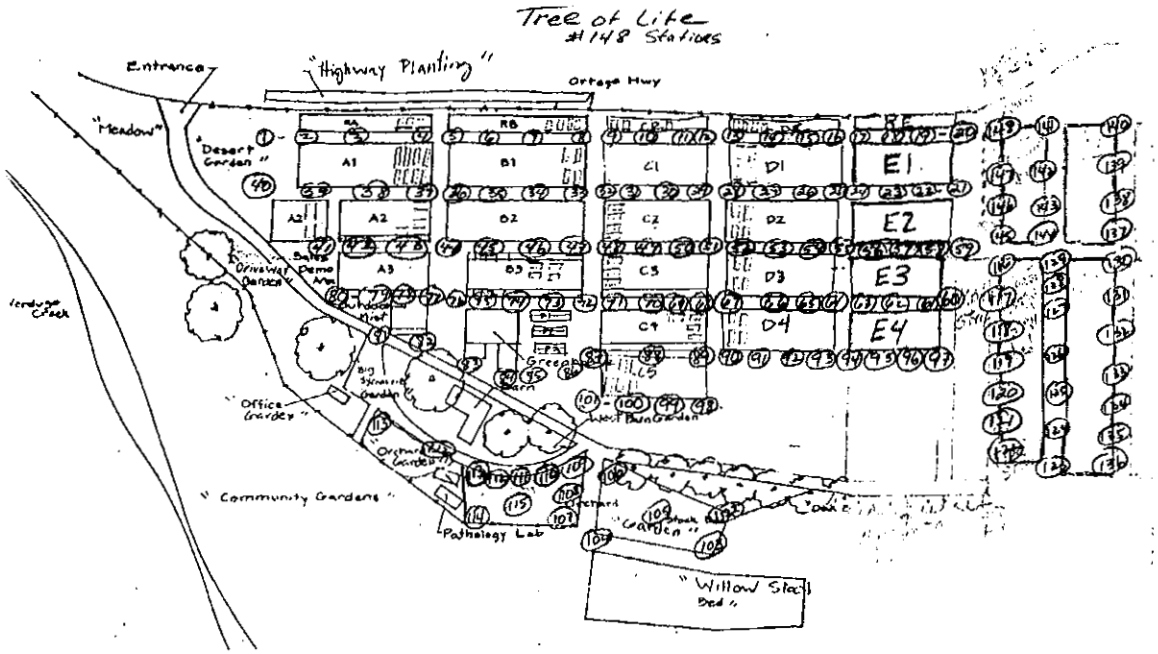

Figure 1. Tree of Life nursery, showing location of ant monitors.

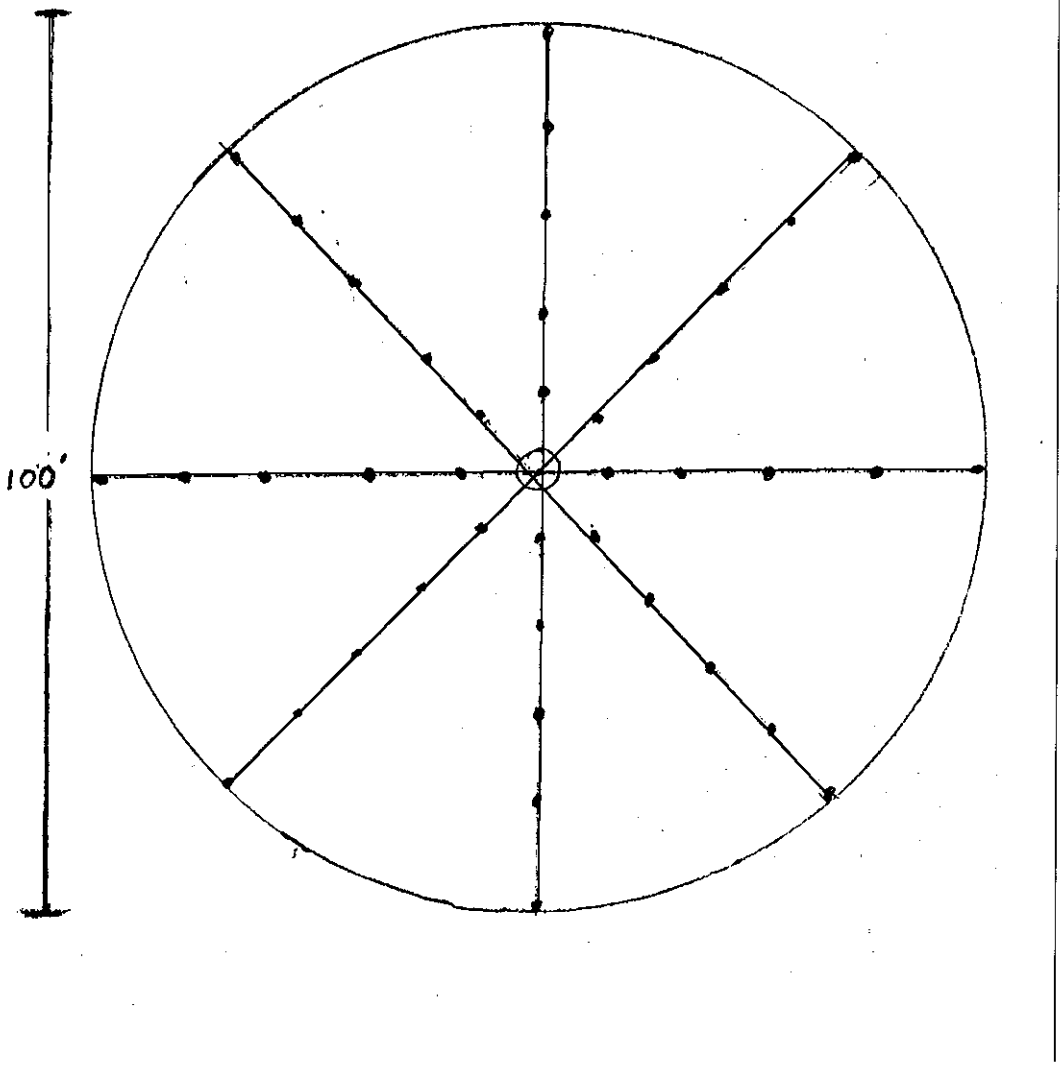

Figure 2. Wheel monitoring method. The known infestation is at the center; each spot represents a monitor location, spaced at 10 ft intervals.

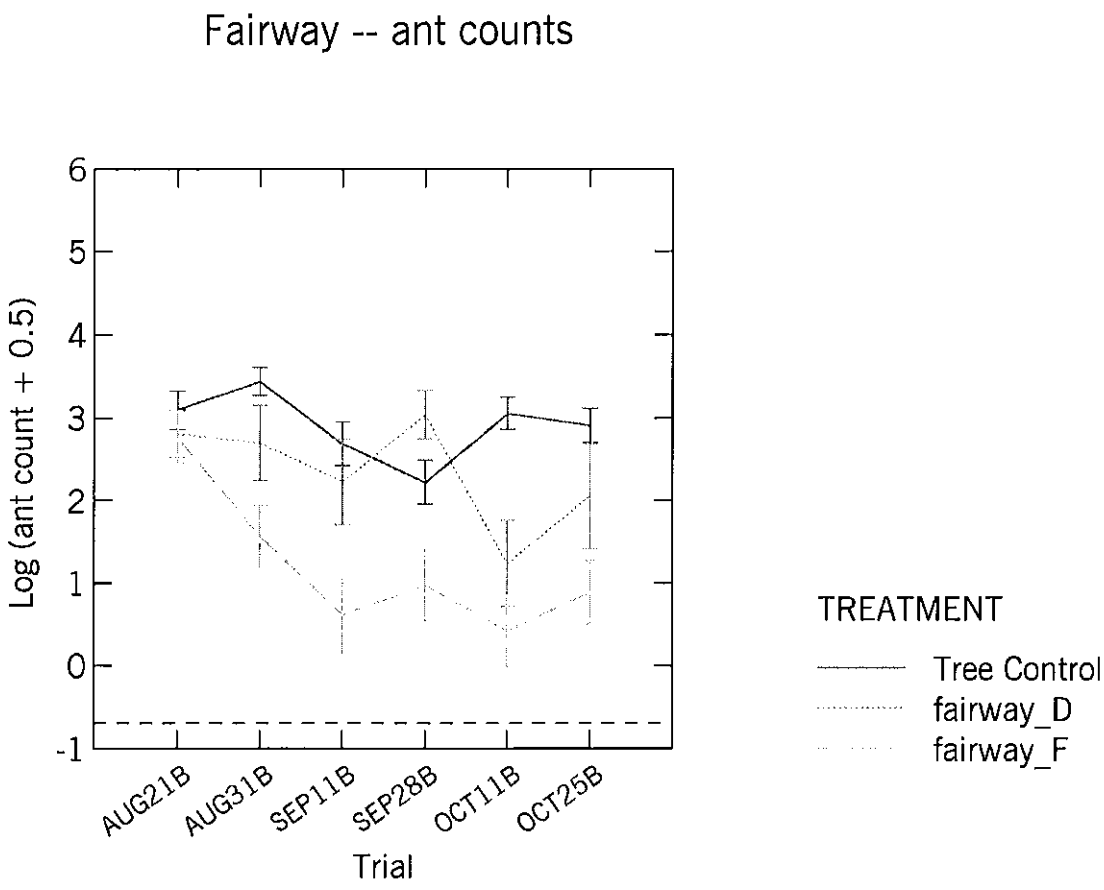

Figure 3. Comparison of fire ant counts after treatment with the standard treatment, Distance fire ant bait (D), and with fipronil granules (F), at Rancho Las Palmas Country Club.

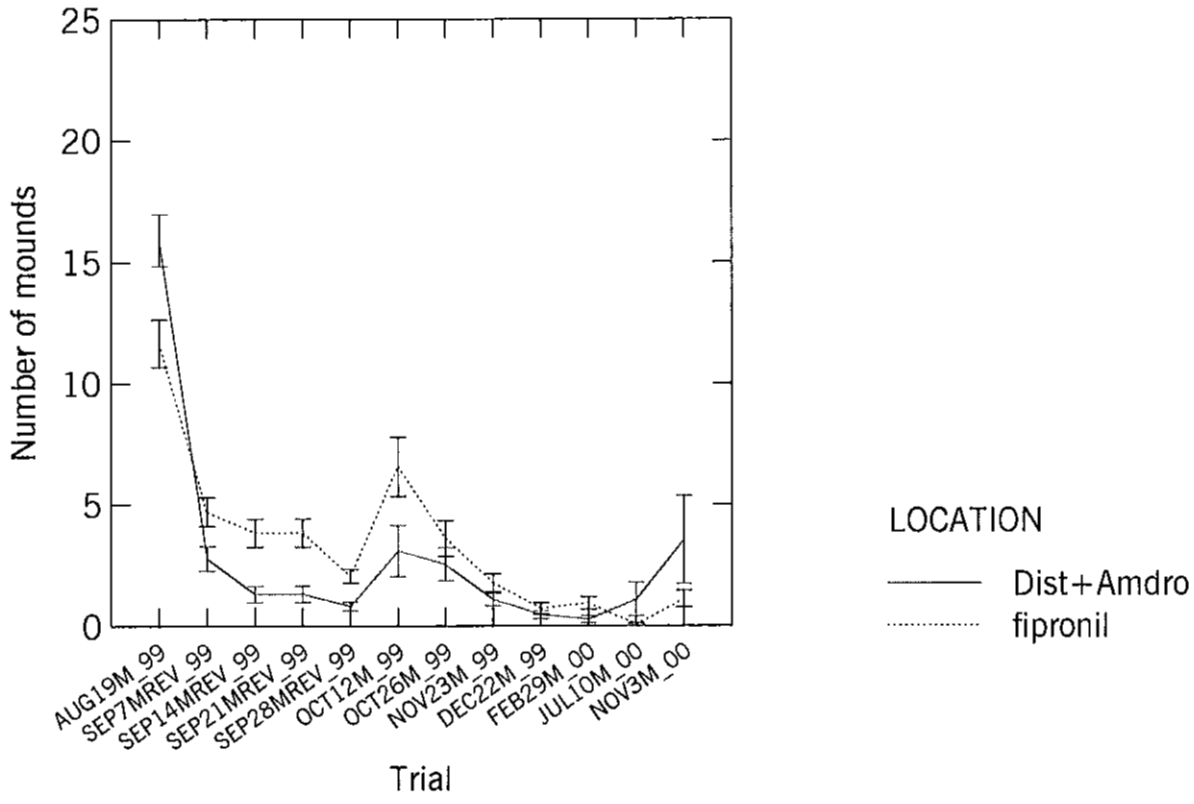

Figure 4. A comparison of standard treatments of Distance + Amdro baits with a single treatment of fipronil granules, at the Sunrise Country Club.

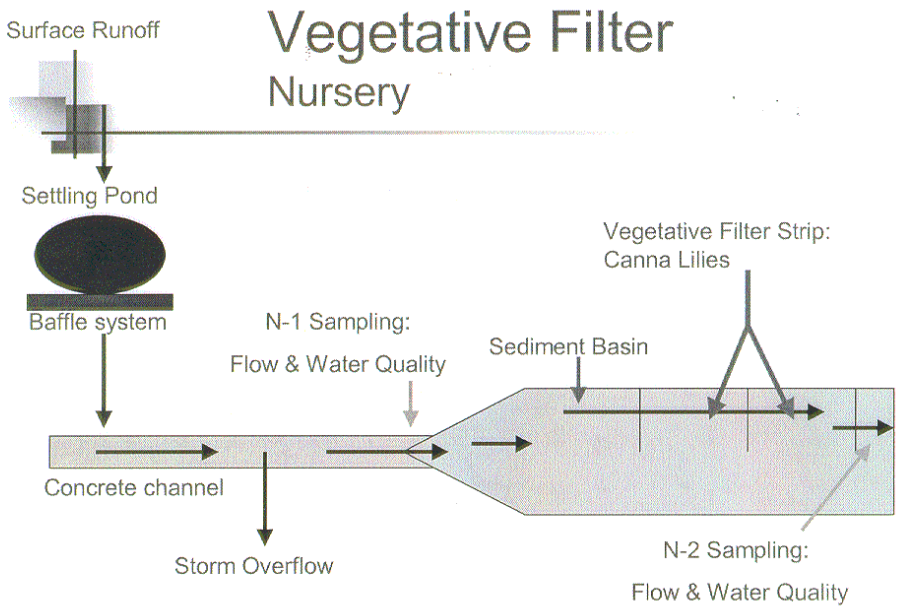

Fig. 5. Schematic and picture of Vegetative Filter at El Modeno Gardens, Irvine, CA.

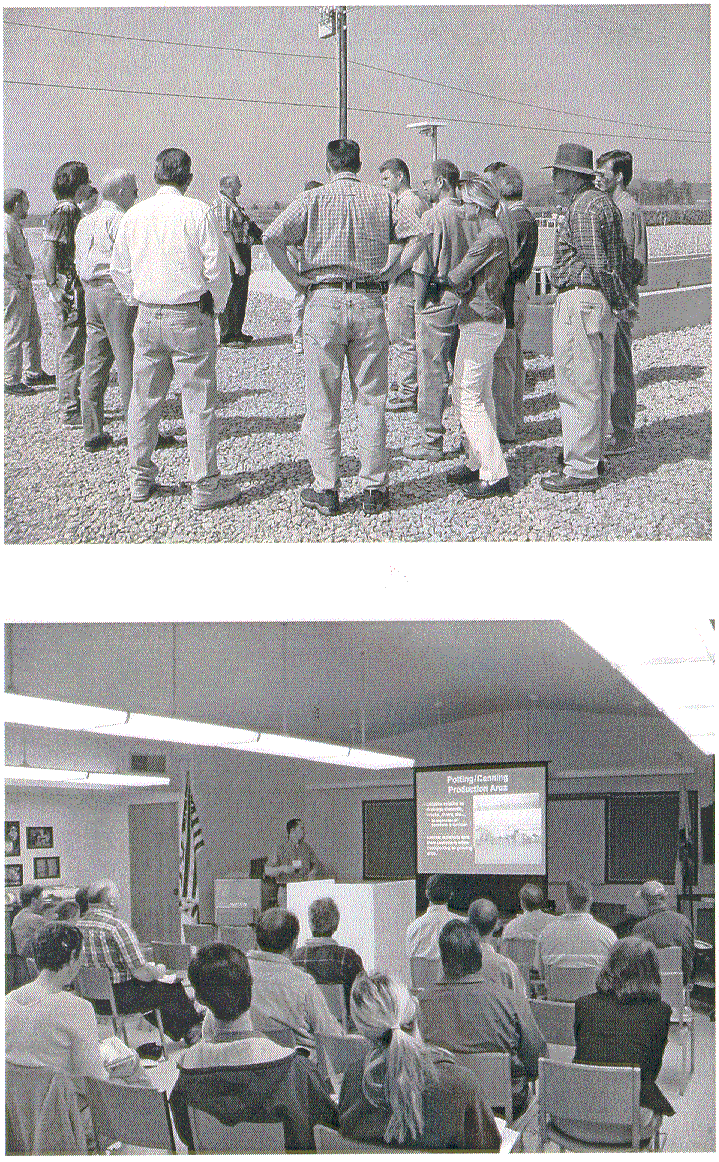

Fig. 6. California Ornamental Research Foundation/Ornamental Horticulture Educational Continuing Conference Meeting at Bordiers Nursery and the South Coast Research and Extension Center, Irvine, California.

Table 1. Ant species collected at Tree of Life nursery.

Cardiocondyla ectopia Snelling
Dorymyrmex bicolor Wheeler (bicolored pyramid ant)
Dorymyrmex insana (Buckley) (pyramid ant)
Formica pilicornis Emery
Liometopum occidentale Emery (velvety tree ant)
Pogonomyrmex occidentalis (Cresson) (harvester ant)
Solenopsis molesta (Say) (thief ant)
Solenopsis xyloni McCook (Southern fire ant)
Tapinoma sessile (Say) (Odorous house ant)
*Linepithema humile (*Mayr) (Argentine ant)
Solenopsis invicta Buren (Red Imported Fire Ant)

Table 2. The species and number of ants collected at liquid and solid baits at Tree of Life Nursery. L = 25% sugar water; S = Nine Lives cat food.

	D. bicolor		*D. insana*		*T. sessile*		*F. pilicornis*		*S. xyloni*	
Date	L	S	L	S	L	S	L	S	L	S
14-Mar-00	1598	41	1	1	79	4	107	5	47	0
4-Apr-00	1707	23	25	2	132	21	132	9	112	3
3-May-00	1246	22	0	0	87	6	39	1	209	25
30-May-00	918	34	430	5	81	12	265	11	217	37
27-Jun-00	1059	75	0	0	85	31	108	5	126	20
1-Aug-00	1125	57	0	0	104	7	75	15	141	0
5-Sep-00	4068	382	0	0	246	6	303	1	523	75
3-Oct-00	2488	526	0	0	242	6	55	14	426	106
31-Oct-00	3963	37	0	0	143	2	42	0	31	5
5-Dec-00	2065	2	2	0	181	0	101	0	4	0
3-Jan-01	1505	21	0	0	0	0	46	0	15	10
6-Feb-01	974	2	0	0	61	0	412	0	40	2

Table 3. The number of monitors positive for each species and the (%) of sites for each date and species at either the 25% sugar water (L), Nine Lives cat food (S), or both (B).

	D. bicolor			*D. insana*			*T. sessile*			*F. pilicornis*			*S. xyloni*		
Date	L	S	B	L	S	B	L	S	B	L	S	B	L	S	B
14-Mar-00	15(47)	2(6)	15(47)	1(50)	1(50)		3(60)		2(40)	8(80)		2(20)	3(100)		
4-Apr-00	32(84)		6(16)	4(80)		1(20)	5(63)		3(37)	8(67)	1(8)	3(25)	3(60)		2(40)
3-May-00	34(76)	1(2)	10(22)				7(78)		2(22)	13(93)	1(7)		3(75)	1(25)	
30-May-00	34(76)	1(2)	10(22)	7(88)		1(12)	4(57)		3(43)	20(83)		4(17)	3(33)		6(67)
27-Jun-00	32(62)	1(2)	19(36)				3(60)		2(40)	9(69)	2(15)	2(15)	4(67)		2(33)
1-Aug-00	38(66)		20(34)				5(63)		3(37)	9(75)	2(17)	1(8)	6(100)		
5-Sep-00	36(52)	1(2)	32(46)				8(73)		3(27)	20(95)		1(5)	4(36)		7(64)
3-Oct-00	23(39)		36(61)				10(77)		3(23)	7(58)		5(42)	3(27)		8(73)
31-Oct-00	45(90)		5(10)				11(92)		1(8)	4(100)			2(67)		1(33)
5-Dec-00	32(94)	1(3)	1(3)	1(100)			4(100)			9(100)			1(100)		
3-Jan-01	20(67)	5(17)	5(17)							7(100)					1(100)
6-Feb-01	20(91)	1(5)	1(5)				5(100)			13(100)					1(100)

Table 4. Insecticide concentrations at mitigation site, June 2001, Orange County, California.

Location	Concentration (ppb)								
	bifenthrin	fenoxycarb	hydramethylnon	pyriproxyfen	chlorpyrifos	diazinon	dimethoate	malathion	methidathion
Surface Water Samples									
Filter strip inflow	0.516	ND[1]	ND	ND	ND	ND	0.053	0.388	ND
Filter strip outflow	0.234	ND	ND	ND	ND	0.044	ND	0.572	ND

1 ND = none detected at the reporting limit for that chemical.

Table 5. List of meetings related to PMA activities. March 1, 2001 – February 28, 2002.

Presentations by Les Greenberg

1. March 2, 2001. Gave talk at national fire ant meetings in San Antonio, TX: "Monitoring fire ants in California".
2. March 6 and 7, 2001. Participated in County training workshops, section on fire ants, for CDFA, under direction of John Blasius, at Palm Desert, CA.
3. March 12, 2001. Meeting of fire ant research committee and Fire Ant Authority Advisory Panel meeting, Garden Grove.
4. March 29, 3:15 pm. 10th Annual Urban Pest Management Conference, Riverside. Fire ant update.
5. March 31, 2001. Presentation on fire ants, along with Larry Cooper of CDFA, Dorsey High School, Los Angeles.
6. April 2, 2001. Demonstration of digging up fire ant colonies for Orange County Fire Ant Authority, Lake Forest.
7. April 25, 2001. Attended meeting about future of fipronil in CA, with Bryan Cahill of CDFA and Kean Goh of CDPR.
8. May 8, 2001. Meeting of fire ant research committee and Fire Ant Authority Advisory Panel meeting, Garden Grove.
9. May 9, 2001. All county fire ant meeting, Costa Mesa. Gave report on how to estimate the age of fire ant colonies.
10. May 29, 2001. 30 min workshop about ant identification and biology for Riverside Co. Agricultural Commissioner's office, Riverside.
11. June 4-8, 2001. Application of *Beauveria bassiana* to fire ant mounds at Lake Elsinore. Ants will be sampled for a month after this application and infection rates determined by growing the fungus in the laboratory.
12. June 12, 2001. Meeting of fire ant research committee and Fire Ant Authority Advisory Panel meeting, Garden Grove.
13. June 13, 2001. All county fire ant meeting, Costa Mesa.
14. June 25, 2001. Collection of fire ant colony at Long Beach, CA. This is the first citing of fire ants in this city.
15. June 26, 2001. Invited speaker in urban entomology section of Pacific Branch meeting of the Entomological Society of America, Park City, Utah. "Status of the Red Imported Fire Ant Invasion of California."
16. July 30 – August 17. Visited RIFA site at Coto de Caza with Orange Co. Fire Ant Authority, and placed sugar water monitors and liquid toxicants at this location.
17. August 9, 2001. Provided write-up on RIFA history, biology, and identification to Mohammed Azhar, CDFA, Costa Mesa.
18. August 9-10. Met with film crew doing documentary about RIFA in Orange Co, including visit to a field location and interview in the laboratory with Daniel Parsons.
19. August 14, 2001. Meeting of fire ant research committee and Fire Ant Authority Advisory Panel meeting, Lake Forest.
20. August 29, 2001. Surveyed new fire ant infestation in Coto de Caza with the Orange Co. Fire Ant Authority.
21. September 6, 2001. Treated a fire ant infestation with the Orange Co. Fire Ant Authority, Coto de Caza, using a new kind of fire ant bait.
22. September 11, 2001. Meeting of fire ant research committee and Fire Ant Authority Advisory Panel meeting, Garden Grove.
23. September 18, 2001. Gave a RIFA workshop to CDFA and Vector Control, Coachella Valley, on how to tell the age of fire ant colonies. Chapparal Country Club, Palm Desert.

24. October 4, 2001. Treated a fire ant infestation at Ladera Ranch, South Orange Co., with new fire ant bait, with the Orange Co. Fire Ant Authority.
25. October 4, 2001. Met with Mohammed Zubaidy of CDFA to discuss questions posed by the national fire ant advisory panel, in preparation for the next meeting of the Orange Co. advisory panel.
26. October 9, 2001. Meeting of fire ant research committee and Fire Ant Authority Advisory Panel meeting, Garden Grove.
27. November 7-9, 2001. Invited to participate in symposium, "Creating a Fire Ant Free Zone," in Orlando, FL.
28. November 13, 2001. Meeting of fire ant research committee and Fire Ant Authority Advisory Panel meeting, Garden Grove.
29. November 27, 2001. PMA meeting to discuss web page design for the group. Orange Co.
30. December 4, 2001. Met with Mohammad Azhar and others from CDFA and the Coachella Valley Fire Ant Authority to discuss ways of monitoring fire ant activity. I demonstrated devices that we have used in our research program. Palm Desert
31. December 11, 2001. Gave talk at the national meeting of the Entomological Society of America, "Liquid toxicants for Red Imported Fire Ants." San Diego, CA.
32. February 11, 2002. Meeting of fire ant research committee and Fire Ant Authority Advisory Panel meeting, Garden Grove.
33. February 13, 2002. All county fire ant meeting, Costa Mesa.

Presentations by John Kabashima and Darren Haver

1. March 17, 2001. Entomology seminar. Orange Co. Cooperative Extension Master Gardener's Training Class, Costa Mesa, 53 participants.
2. March 23, 2001. Total Maximum Daily Loads (TMDL) lecture and tour. CA Ornamental Research Foundation/Ornamental Horticulture Educational Continuing Conference Meeting, Irvine, CA, 25 participants.
3. April 11, 2001. TMDL Project Lecture. Irvine Ranch Water District Board, Irvine, CA, 10 participants.
4. April 12, 2001. Red Gum Lerp Psyllid Interview, by Mike Anton, LA Times, Irvine, CA.
5. April 23, 2001. Lecture and tour of Environmental Horticulture/Natural Resources in Orange Co., UC DANR VP Lanny Lund Tour, 5 participants.
6. May 9, 2001. Nursery pesticide mitigation lecture and tour. TMDL update, Irvine, CA, 14 participants.
7. May 17, 2001. Research update. Southern California Agricultural Production Consultants Association (CAPCA), Irvine, CA, 50 participants.
8. May 18, 2001. Greenhouse whitefly biology and TMDL workshop. Greenhouse whitefly meeting, Irvine, CA, 20 participants.
9. June 6, 2001. San Diego CAPCA Meeting, Windmill Restaurant. Attendance: 150. Lecture Topic: Mitigating pesticide runoff from Nurseries
10. June 7, 2001. Photo shoot. Had Jack Kelly Clark take professional photos of the Vegetative Filter Strip at El Modeno Gardens.
11. June 14, 2001. Talked to the Chair of the CAN PPIC committee to arrange having their committee information placed on the PMA website.
12. June 19, 2001. Arranged a field visit with Jeff Bohn from Tree of Life Nursery and Dr. Cheryl Wilen to discuss setup of a trial to control liverwort. Trial would include several non pesticide techniques.

13. June 20, 2001. Met with Dr. Letey and Gan at El Modeno Gardens to evaluate how we could use long chain polyacrylamides to remove bifenthrin-containing sediment from runoff water.
14. June 28, 2001. Conducted RIFA soil repellency tests with various candidate non-toxic chemicals at SCREC.
15. July 10, 2001. Attended OC FAA oversight committee meeting to provide scientific oversight and update them on PMA projects such as the pesticide runoff mitigation work.
16. July 12, 2001. Met with manufacturer of long chain polymer polyacrylamides to discuss experiments to use their product to settle out sediments.
17. July 13, 2001. Discussed mitigation of bifenthrin in nursery runoff with the manufacturer of bifenthrin (FMC).
18. July 19, 2001. Conducted initial polymer trial at El Modeno Gardens to mitigate pesticide runoff.
19. August 6, 2001. Worked out details with Dennis Pittenger regarding placing UC Nursery Information Center leaflets on the PMA website.
20. August 14, 2001. Attended OC FAA oversight committee meeting to provide scientific oversight and update them on PMA projects such as the pesticide runoff mitigation work.
21. August 15, 2001. Attended All County RIFA meeting to provide scientific expertise and report on Pesticide runoff mitigation work.
22. August 15, 2001. Facilitated a planning meeting at El Modeno Gardens with CDPR, CDFA, UCR, and UCCE to present results of mitigation project and to plan future work that needs to be done.
23. August 29, 2001. Gave a lecture to 75 nursery professionals at the California Association of Nurserymen Certified Nursery Professional continuing education conference at the Hacienda Hotel, Los Angeles on mitigating pesticide use and offsite movement of pesticides.
24. August 31, 2001. Heard unofficially that the El Modeno Gardens vegetative filter strip may be getting an IPM Innovator of the year award.
25. Sept 4, 2001. El Modeno Gardens receives an IPM Innovator Award. Gave a lecture on Entomology, IPM and pesticide mitigation to Orange Co. College IPM Class. Approximately 20 students.
26. Sept 19, 2001. Worked out preliminary content design of the PMA Website
27. Oct 18, 2001. Gave a lecture to the Ornamental Horticulture class at Mt. San Antonio Junior College on mitigation of pesticide and fertilizer runoff from nurseries and the landscape.
28. Nov 27, 2001. Attended the PMA website meeting and evaluation. CAN has officially agreed to host the website if we buy them a server and provide content.
29. Nov 28, PMA co-sponsored a California Certified Crop Advisor training meeting on mitigation of pesticide and fertilizer pollution in runoff from nurseries and greenhouses at Edison Stadium in Anaheim. There were about 50 attendees.
30. December 19, 2001 – Hydrosorb, Inc. – Meet with Hydrosorb representatives at El Modeno Gardens for polyacrylamide demonstration.
31. January 23, 2002 – UCR Total Maximum Daily Loads (TMDL) Workshop – Presentation by Darren Haver on the nursery mitigation project to UC faculty, extension specialists, and farm advisors. Approximately 20 people in attendance.
32. February 6, 2002 – California Plant and Soil Conference – Presentation by John Kabashima on Newport Bay Total Maximum Daily Loads Project including the Nursery Mitigation Project. Approximately 125 people in attendance.
33. February 25, 2002 – Society of American Florists – Presentation by Darren Haver on the nursery mitigation project to professionals in the nursery and pesticide industries. Approximately 170 people in attendance.

Presentations by Cheryl Wilen

1. March 23, 2001. IPM and TMDLs for Nurseries, UCCE training meeting, 40 people, Irvine.
2. May 11, 2001. Alternatives to Pesticides, ROPS Training Class, 25 people, Chula Vista.
3. May 16, 2001. Pests and Plant Nutrition, CCA Seminar, 50 people, Carlsbad.